

REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Official Action dated May 24, 2004. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

Claims 4-8 are under consideration in this application. Claims 4-7 are being amended, as set forth in the above marked-up presentation of the claim amendments, in order to more particularly define and distinctly claim applicants' invention. A new claim 8 is being added to recite another embodiment described in the specification.

Additional Amendments

Claims 4-7 and the Abstract are being amended to correct formal errors and/or to better recite or describe the features of the present invention as claimed. All the amendments to the claims are supported by the specification. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

Formality Rejection

Claims 4-8 were rejected under 35 U.S.C. § 112, second paragraph, on the grounds of being vague and indefinite. As indicated, the claims have been amended as required by the Examiner. Accordingly, the withdrawal of the outstanding informality rejection is in order, and is therefore respectfully solicited.

Prior Art Rejection

Claims 4 and 5 were rejected under 35 U.S.C. 102(e) on the grounds of being anticipated by U.S. Pat. No. 6,284,465 to Wolber (hereinafter "Wolber"), and claims 4-6 and 8 were rejected under 35 U.S.C. 102(e) on the grounds of being anticipated by U.S. Pat. No. 6,362,004 to Noblett (hereinafter "Noblett'004"). Claims 4, 5 and 7 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5,812,272 to King et al. (hereinafter "King") in view of Noblett'004, over U.S. Pat. No. 6,188,783 to Balaban et al. (hereinafter "Balaban") in view of

Noblett'004, and over U.S. Pat. No. 6,349,144 to Shams (hereinafter "Shams") in view of Noblett'004. Claims 6 and 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over King or Balaban or Shams in view of Noblett'004, and further in view of U.S. Pat. No. 6,471,916 to Noblett et al. (hereinafter "Noblett'916"). These rejections have been carefully considered, but are most respectfully traversed, as more fully discussed below.

The method for indexing a microarray chip 10 (e.g., Fig. 1B) with a plurality of spots 15 arranged in a predetermined positional relationship thereon of the invention, comprises: selecting some of the plurality of spots as index spots 17 (p. 4, lines 15-16); spotting at least one biological element (e.g., "*elements (probes)*") p.1, lines 14-15) onto one of remaining spots as a non-index spot; indexing (e.g., in binary codes; "*the index information is reproduced by detecting the presence or absence of a detective colorant on the index spots*" last sentence of claim 5 as originally filed) the microarray chip 10 spotted with said biological element by selectively providing at least one kind of detective colorant onto the index spots 17 thereby coding in the index spots a unique microarray index value 65 (p. 12, lines 7-8 "*for example, 128 bits*"), said microarray index value being linked to *element information* ("*elements immobilized on the microarray chip are linked via the same microarray index (65)*" p. 12, lines 16-18; "*an element index to be linked (66) to the element information record*" p. 12, lines 21-22) which includes a type of said biological element and a location of said non-index spot on the chip (p. 2, lines 4-5); and (**Claim 4**) automatically ("automatic" p. 3, line 15) identifying ("*indexing the microarray chip for identification*" p. 1, lines 7-8; "*the chip be identified*" p. 2, line 19) the microarray chip (based upon the element information "*since the shape of the microarray chips are all identical, each microarray chip cannot be identified by its appearance*" p. 2, lines 16-18) by detecting said detective colorant provided on said index spots, or (**Claim 5**) reproducing the element information by detecting the presence or absence of said detective colorant provided on the index spots thereby automatically identifying the microarray chip.

In claim 6, the index spots are arranged in a two-dimensional matrix (Fig. 3) including some of the index spots 26 designated as parity spots 27 and provided with said detective colorant based upon a parity algorithm running by row and by column of the matrix (p. 9, last paragraph). Upon reproducing the element information, the parity spots 27 are checked for errors ("*for detecting any error of any [index] spot at a particular position*" p. 9, lines 14).

Claim 7 (Fig. 6) further recites the steps of: constructing a database for storing an element information record 63, a microarray chip master record 61, and a biological element information

record 62; recording information of said element on the element information record with an element index 66 (i_elmid); recording information of the microarray chip 10 on the microarray chip master record 61 with a microarray index 64 (r_aryid); recording, on the biological element information record 62, information of the microarray index 64, said location of said non-index spot on the microarray chip 10, said element index 66 of said element spotted on said location, and information of experiment conducted ("*information of the microarray chip experiment*" p. 12, line 23; p.13, lines 17-18) and measurement taken in said non-index spot ("*measurement information*" Fig. 6); linking the microarray chip 10 with the microarray chip master record 61 as well as the biological element information record via the microarray index 64, 65 coded in the index spots; and linking the biological element information record 62 with the element information record 63 via the element index 66.

The plurality of spots of microarray chip can be arranged in a two-dimensional matrix, while the index spots are selected as (1) one row or one column of the matrix (Fig. 4B); (2) as two rows or two columns of the matrix (Figs. 4C-D); or (3) as three sections on each of three rows or columns of the matrix (Fig. 4A). Other embodiments are shown in Fig. 5.

In other words, the invention codes a unique microarray index value being linked to element information in the index spots by providing detective colorant thereon thereby automatically identifying the microarray chip spotted the particular biological elements without printed letters, numbers, symbols or barcodes on the chip (p. 2, last two paragraphs).

Applicant respectfully submits that none of the cited prior art references discloses, teaches or suggests such a step of "indexing the microarray chip spotted with said biological element by selectively providing at least one kind of detective colorant onto the index spots thereby coding in the index spots a unique microarray index value, said microarray index value being linked to element information which includes a type of said biological element and a location of said non-index spot on the chip" and a step of "automatedly identifying the microarray chip by detecting said detective colorant provided in said index spots" according to the invention.

In contrast, the alleged "indexing spots" in Wolber, i.e., non-probe regions 15, are not "spots" but cheese-shaped regions on substrate surface between the spots that are devoid of spots immobilized with nucleic acid probes 12 (Fig. 1; col. 14, lines 65-67). Fig. 1 shows a front view of a microarray 10 in a square-shaped portion and a L-shaped portion for simplification each region containing both probes 12 and non-probe regions 15, rather than a region containing only

index spots and a region containing only non-index spots.

Wolber uses contrast of optical signals from the probes and non-probe-bound substrate regions to locate/identify the probe features 13 (col. 20, lines 19-20; “a *particular feature 13 have the same nucleotide sequence*” col. 14, lines 55-57) via optical signals 14 (col. 17, lines 34-36) and the hybridized probe features 17 (col. 1, lines 9-10; col. 16, lines 53-55; Fig. 1) via optical signals 18. As such, Wolber merely concerns identification at a feature level, rather than at a microarray level. Wolber’s probes 12 and non-probe regions 15 clearly are not coded with a unique microarray index value linked to element information thereby identifying the chip immobilized with said biological element.

The dilution spots 119 of Noblett’916 were relied upon by the Examiner to teach the index spots of the invention. However, the dilution spots 119 are set only for the purpose of calibration, and they are not coded with a unique microarray index value linked to element information thereby identifying the chip immobilized with said biological element.

King physically encodes a tagged file (including array/element information) to a microarray via a silicon ship, a magnetic strip, or a bar code (col. 11, lines 38-47), which are exactly the prior art the invention successfully improved (p. 2, last two paragraphs). However, King fails to encode a unique microarray index value linked to *element information* in the index spots by providing detective colorant therein. The calibration fiducial marks of Noblett’004 are relied upon by the Examiner to teach the index spots of the invention. However, the fiducial marks of Noblett’004 are merely used for maintaining position information thereby precisely depositing the microarray in a predetermined position. Noblett’004 does not encode a unique microarray index value linked to element information in the fiducial marks. The most intuitive combination of the two references by one skilled in the art would lead to coexistence of the calibration fiducial marks of Noblett’004 and King’s silicon ship, etc., rather than substituting King’s silicon ship with the calibration fiducial marks of Noblett’004 as suggested by the Examiner. One skilled in the art could not index a microarray chip as claimed by the Applicants based on the above prior teachings except by using Applicants’ invention as a blueprint. Applicants will point out that a rejection based on hindsight knowledge of the invention at issue is improper.

Balaban only stores the alleged index information (representing the relationship between the probe records and the sequence records) on a database. At most, Balaban identifies the chip by the alleged index/element information directly which is usually lengthy and cumbersome,

rather than any coded element information contained in the detective colorant in the index spots. Therefore, Balaban falls short of teachings of “indexing the microarray chip spotted with said biological element by selectively providing at least one kind of detective colorant onto the index spots thereby coding in the index spots a unique microarray index value, said microarray index value being linked to element information which includes a type of said biological element and a location of said non-index spot on the chip” according to the present invention

Shams uses grid points (including position information) to adjust the DNA spot images, but fails to “index the microarray chip spotted with said biological element by selectively providing at least one kind of detective colorant onto the index spots thereby coding in the index spots a unique microarray index value, said microarray index value being linked to element information which includes a type of said biological element and a location of said non-index spot on the chip” according to the present invention

Applicants contend that the cited prior art references fail to teach or disclose each and every feature of the present invention as recited in independent claims 4 and 5. As such, the present invention as now claimed is distinguishable and thereby allowable over the rejections raised in the Office Action. The withdrawal of the outstanding prior art rejections is in order, and is respectfully solicited.

Conclusion

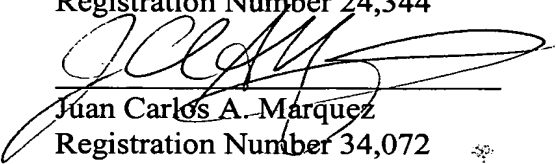
In view of all the above, clear and distinct differences as discussed exist between the present invention as now claimed and the prior art reference upon which the rejections in the Office Action rely, Applicant respectfully contends that the prior art references cannot anticipate the present invention or render the present invention obvious. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of

the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and phone number indicated below.

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